

EUV Synchrotron Source

What does it mean to have a Synchrotron in
a Fab?

Light output

Pros and cons of Synchrotrons

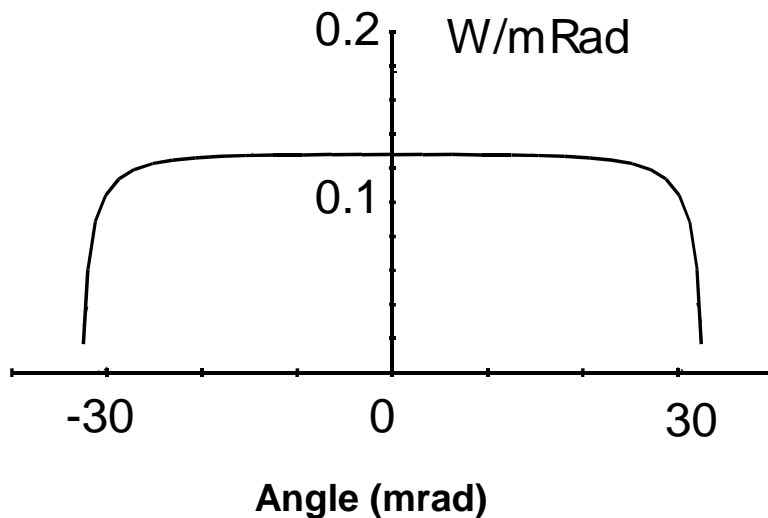
Practical operations issues

Conclusion

D Ockwell, N Crosland,
A Day & V Kempson

Hybrid Wiggler - Light output

Output power in 2% band at
13nm



	Hybrid wiggler	Supercon wiggler	LPP (at 11.34nm)
Output power	8w	16w	50w
Coupling	60%	75%	27%
Window loss	0	0	50%
Gas loss	0	0	20%
Result	4.8	12w	5.4w

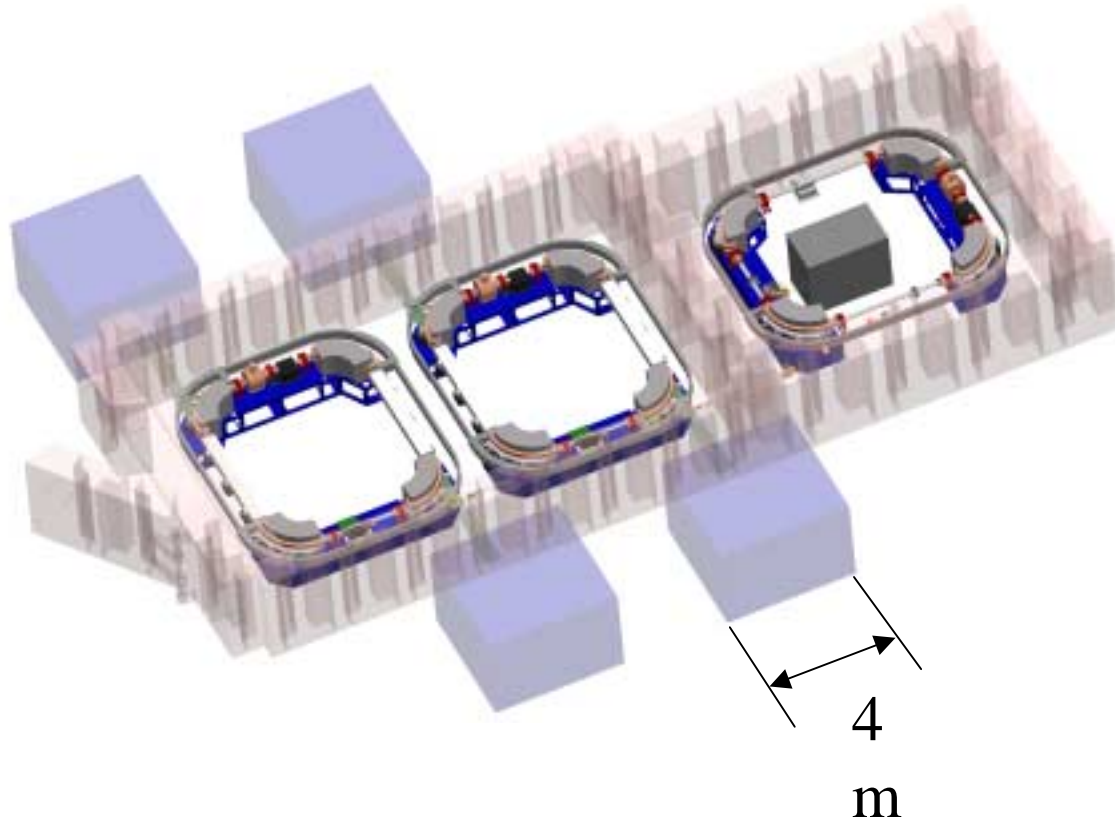
Synchrotron pros and cons

- + Completely clean (no window required)
- + No consumables
- + CW light output - no pulse to pulse stability issues
- + Proven reliability
- + No Be (safety) hazard
- + High proportion of in band power

Synchrotron pros and cons

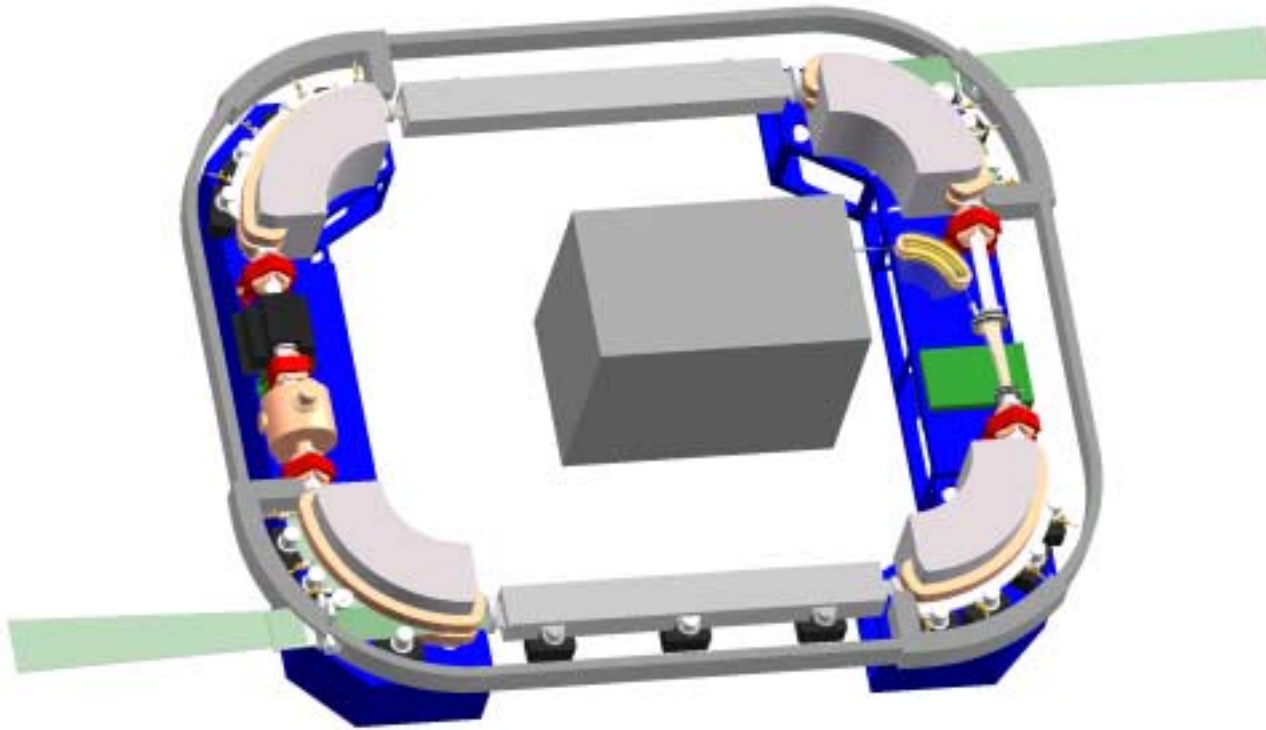
- + Same source for future roadmap nodes
- - Size
- - Concrete shielding required
- - Source granularity at introduction
- = Safety (SR radiation vs laser chemicals)
- = CoO (equal to LPP)

2 Eu-Two and booster



Up to 10 storage rings per Booster

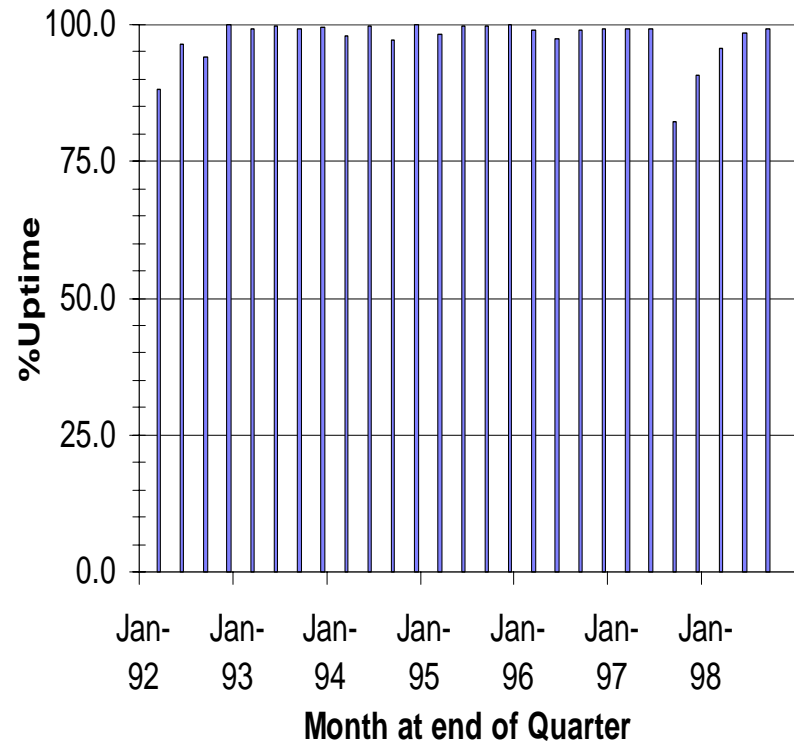
Eu-Two - Low Energy Injection



Allows low cost start for up to 2 steppers

Operations - Reliability

- HELIOS 1 operated for eight years at IBM
- IBM:
- “The most reliable tool in the Fab.”
- “Would have been better with improved spares policy”.



Reliability

- NO moving parts (except electrons)
- HELIOS demonstrated track record in Fab.
- Equipment in vault minimised
- Improvements to be based upon reliability data from HELIOS 1
- Linac injector changed to microtron

Operators: HELIOS 1

- On site team of 3 graduate engineers

Plus

- Unattended overnight running
- Weekend start ups by stepper operators and minimally trained IBM staff
- Was often run by technicians
- You don't need special people

Operations - Radiation safety

- Shield design allows non radiation workers in steppers area
- Vault access controlled by failsafe safety interlocks
- Safe to enter vault with booster off
- Registered radiation workers needed for initial vault entry only
- Operators need not be radiation workers

National vs. Compact sources

- Multi - function vs. dedicated function
- Many operating modes vs. one
- Unique design vs. one of series
- Designers on site vs. operators on site
- Focus on new research vs. focus on reliability
- They are different !

What does it mean in a Fab?

- SR has to be fitted in
- SR requires some new learning
- BUT
- SR costs the same as LPP
- SR provides the right output
- SR is a mature technology
- SR has proven reliability